THE
ONTARIO WATER RESOURCES
COMMISSION

WATER POLLUTION SURVEY

of

TWENTY MILE CREEK

1970

REPORT

ON A

WATER POLLUTION SURVEY

OF

TWENTY MILE CREEK

1970

District Engineers Branch

Division of Sanitary Engineering

INDEX

R E P O R T

THE ONTARIO WATER RESOURCES COMMISSION

INTRODUCTION

Following complaints by local residents regarding the condition of Twenty Mile Creek, the District Engineers Branch of the Ontario Water Resources Commission conducted a water pollution survey of the Creek and its tributaries. The survey was composed of several sample runs extending over the spring, summer and fall of 1969.

The purpose of the survey was to determine the presence and extent of pollution gaining access to Twenty Mile Creek.

I GENERAL

(1) PREVIOUS STUDIES

(a) Water Pollution Survey of the Hamlet of Mount Hope (1966)

This survey indicated that nearby watercourses, i.e. mainly Three Mile Creek, a tributary of Twenty Mile Creek, were receiving domestic sewage discharges from malfunctioning septic tank and tile field installations.

(b) Water Pollution Survey of the Township of Binbrook (1968)

This survey reported that domestic waste was gaining access to a drainage ditch running through the Hamlet of Binbrook and that impairment of a Twenty Mile Creek tributary at County Road 24 was evident. A piggery operation in Concession III, Block 4, was cited as permitting manure wastes to enter the nearby Twenty Mile Creek tributary.

(c) Water Pollution Survey of the Township of Louth (1969)

This report concluded that extensive domestic pollution was taking place in the former Police Village of Jordan Station and that minor pollution problems existed in other areas of the Township.

(2) AREA CONDITIONS

(a) Location and Topography

The headwaters of Twenty Mile Creek are situated approximately 2.5 miles northwest of the Hamlet of North Glandford at an elevation of 752 feet. It then follows an easterly direction parallel to the Niagara Escarpment, swings northward about one mile south of the Hamlet of Tintern, crosses the escarpment at Jordan and empties into Lake Ontario at an elevation of approximately 245 feet.

The majority of the drainage basin is located in the Haldimand Clay Plain with low, easterly trending morainic ridges separating the basin from the Welland River Basin on the south and the Forty Mile Creek Basin on the north. The gradient is relatively shallow with an average value of 5.4 feet per mile. In the downstream reaches, the bed of the stream is bedrock. The drainage area contains approximately 113 square miles.

(b) Climate

The climate of the Twenty Mile Creek watershed area is influenced by the close proximity of Lake Ontario in the north and of Lake Erie in the south. The average annual precipitation ranges from 31 inches in the western part of the area to over 34 inches in the eastern part. The mean annual temperature also varies from 46°F in the west to over 48°F in the east near the shore of Lake Ontario.

(c) Agriculture

Farming in the area is mined with mainly fruit orchards located near Jordan, and vegetable farms near Binbrook.

(d) Flows

The three sampling runs showed large seasonal fluctuation in the flows of Twenty Mile Creek. Mean flows of the Creek are approximately 80 c.f.s. but this varies to almost zero flow during the summer months. After a slight rainfall, stream flow increases rapidly but for only very short durations. There are many natural on-stream ponds located in the area and these contain water for the greater part of the summer.

(e) Recreation

Twenty Mile Creek facilitates no major recreational facilities except for the Ball's Falls Conservation Area. This is due to a lack of summer flow. The conservation area contains

approximately 160 acres in lots 20, 21 and 22 of Concession V and VI in the Town of Lincoln (formerly Louth Township) and centres around the creek's 85-foot drop over the Niagara Escarpment, which is known as Ball's Falls.

Also a marina, located at the mouth of the creek near the Q.E.W., services boats which utilize the waters in this region.

(3) WASTE SOURCES

(a) Municipal

Included in the following are the major population centres in the study region: Jordan Station, Jordan, Tintern, Campden, St. Anns, Smithville, Woodburn, and Mount Hope.

The only community having facilities for the collection and treatment of sewage is Smithville containing some 1100 persons.

Residents in the remaining communities dispose of their sanitary wastes by individual treatment systems.

The only private establishment in the watershed producing a significant volume of waste is the Bethesda Home for the Aged. Wastes from the home and from the staff residence are discharged to a 1.5 acre single cell lagoon with a design depth of 4.5 feet. Drainage of the lagoon is facilitated by a valved drain pipe which discharges to a small tributary of Twenty Mile Creek. The lagoon serves 110 patients and 22 staff members. Contents of the lagoon are discharged once a year during the spring runoff period.

(b) Industrial

Twelve major waste producing industries are included in the area. Descriptions of these operations and waste handling procedures are outlined in Appendix II. Locations may be determined from the survey map 70-23-DE (Appendix III).

(c) Agriculture

The Twenty Mile Creek drainage basin contains a major agricultural district. Increasing problems have resulted in the handling and disposal of agricultural wastes because of the increased trend towards large-scale confinement operations throughout the watershed.

II. SAMPLING PROCEDURE

Sampling was conducted during the spring, summer and fall of 1969, throughout Twenty Mile Creek and its tributaries. The sampling points are listed in Table I, II, III and IV (Appendix I).

Twenty-eight (28) stations on Twenty Mile Creek, and an additional ten (10) among the tributaries were selected for sampling.

Analysis included Biochemical Oxygen Demand, suspended solids, bacteriological counts, the nitrogen spectrum, phosphorous and A.B.S. For information regarding the reasons for utilizing these tests, see Appendix IV.

III. SURVEY RESULTS

For complete statistical analysis and graphical interpretation of the results see the tables and graphs in Appendix I. Particular attention should be directed towards the specific areas west of Nebo Road, Highway No. 56, Smithville, the mouth of Spring Creek, and from Jordan to the mouth of Twenty Mile Creek at Lake Ontario.

IV. DISCUSSION

Due to the length of Twenty Mile Creek, the discussion of the results has been divided into five segments. Locations of these segments can be found on the accompanying drawing (see Dwg. A, Appendix III).

Flow in the tributary creeks west of Nebo Road was found to be very sporadic depending strictly on local weather conditions. The two samples collected from Three Mile Creek showed both faecal coliform organisms and trace A.B.S. concentrations, indicative of domestic waste (see Tables I, II, III, IV and Graph 3, Appendix I). The analyses for Kjeldahl nitrogen and nitrate nitrogen also indicated that Three Mile Creek was receiving waste loading. This presence could have been due to either the suspected domestic discharge or to agricultural runoff. The levels noted were sufficiently high to promote algal growth (see Tables I, III, and Graphs 5, 6, 7, Appendix I).

The samples collected at Nebo Road, Highway No. 56 and Woodburn all showed the presence of A.B.S., (see Table II, Appendix I), and periodically high faecal coliform counts, (see Table I, Appendix I). As can be noted graphically (see Graphs 1, 3, 4, 5, 6, 7, 8, Appendix I) the area,especially around Highway No. 56, is receiving pollution discharges. There are no known specific discharges occurring in this area, however, mal-functioning septic tanks and tile field installations are contributing to the stream organic loading throughout this region.

Analyses results from the section of the creek between Townline Road and the community of Kimbo indicated that this reach was in a reasonably satisfactory condition with one notable exception. The fall sample collected at South Grimsby Road #15 showed a BOD concentration of 5.9 mg/l with a faecal coliform count of 1000 organisms per 100 ml. (see Table I, Appendix I). This same sample also contained an adequate total phosphorous concentration to stimulate algal blooms (see Table II, Appendix I). The Delassio Slaughterhouse is located upstream from this sample, and reports had been received concerning the occasional discharge from this operation's waste treatment lagoon. Since the completion of this survey the facilities had been improved. One sample collected at station T-28.8 exhibited a BOD of 22 mg/l (see Table I, Appendix I), but,

lacking any other chemical or bacteriological signs of gross impairment, it was felt that this was not a representative sample. A single sample obtained from Sinkhole Creek downstream from several processing operations did show bacteriological contamination (see Table I, Appendix I), but did not indicate impairment due to waste discharges from these operations (see Table IV, Appendix I).

The results of the survey indicated that between Kimbo and St. Anns, the highest nutrient, BOD, and suspended solids concentrations were found, as well as the highest bacteriological counts (see Graphs 1 to 8, Appendix I). Attention is particularly directed towards the increases seen in nitrogen and phosphorous concentrations as Twenty Mile Creek passes through this area. Four storm sewer outfalls, located in Smithville at Canborough Street, were sampled and based on the assembled analyses results, (see Table I, III, Appendix I) it was concluded that sanitary sewage was reaching Twenty Mile Creek via these storm sewers. Additional impairment may be attributed to runoff from the adjacent high density farming operations, prevalent in this area, and to continuous discharges of the Smithville sewage lagoon where 1969 average effluent concentrations were found to be 37 ppm BOD and 70 ppm suspended solids (see OWRC 1969 Analysis File, Vol. 4, for South Grimsby). North Creek contributes further nutrient concentrations to Twenty Mile Creek below Smithville as seen in the analyses of several samples collected from this tributary (see

Tables III and IV, Appendix I). Since North Creek drains primarily agricultural lands, this load is probably due to agricultural runoff. At the North Creek Bridge, a large plastic bag of animal remains was removed from the stream. It was not possible to determine the type or origin of these wastes.

Between the community of St. Anns and Lake Ontario, the water quality of Twenty Mile Creek gradually improves. However, high coliform counts and A.B.S. were noted in the Jordan area, indicative of domestic waste gaining access to the Creek (see Table II, Appendix I). An increase in the coliform count and Kjeldahl nitrogen was noted in Twenty Mile Creek after passing through Tintern. The loading appeared to be very minor and in all probability was due to private sewage disposal systems in the community (see Table I, Appendix I). A single sample,collected during the fall sampling run (see Table II, Appendix I) at the County Line Road, also showed stream impairment. Nutrient concentration was sufficient to promote algal blooms. North of Tintern, Spring Creek enters Twenty Mile Creek. Several analyses were conducted on this Creek and two instances of waste discharges were noted. Piggery wastes from the Barnum Hog Farm and septic tank effluent from a home immediately across from the farm were impairing the quality of the water in Spring Creek and subsequently Twenty Mile Creek (see Table III, IV, Appendix I).

V CONCLUSIONS

The purpose of the survey was to determine the presence and extent of pollution gaining access to Twenty Mile Creek. In the majority of cases abundant algal growths were occurring during the summer months in ponded areas of the Creek. Nutrient enrichment was observed throughout the entire watershed and can be related to the indirect access of barnyard drainage, land fertilization and the presence of farm animals on the land adjacent to the Creek and its tributaries.

The Creek exhibited the highest pollutional loading in the Smithville area, as evidenced by the peaks on the graphs 1 - 8, Appendix I. Other problem areas include, the region just downstream from the entrance of Spring Creek, and the area around Highway No. 56. As evidenced in the peaks on the Graphs 2 - 8, Appendix I, Spring Creek could be considered as a potential source of pollution of Twenty Mile Creek, due to the drainage from farm areas and scattered faulty private disposal systems.

RECOMMENDATIONS

It is recommended that:

1. Home owners in the areas adjacent to the Creek or its tributaries having private sewage systems, i.e. septic tank and tile field installations, pay greater attention to their maintenance and operation and have them inspected periodically to insure they are not causing contamination.
2. Home owners not connected to the municipal sewer system in Smithville have their systems checked for possible malfunctions and contamination of the storm sewer system.
3. The storm sewer system in Smithville be examined for cross-connections between the sanitary and storm sewer systems or illegal connections.

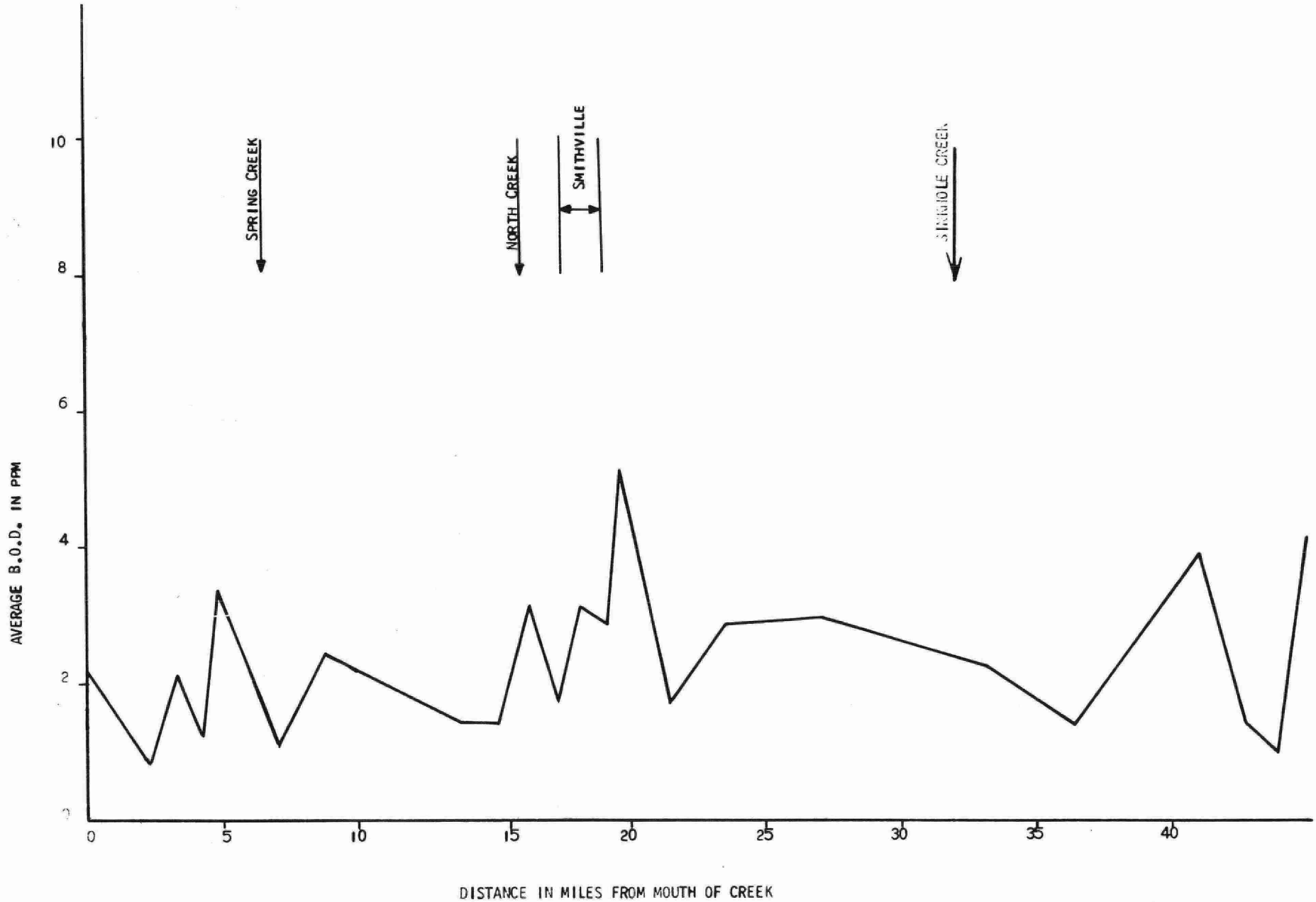
Prepared by: _____

D.A. Jones, Civil Technologist,
District Engineers Branch,
Division of Sanitary Engineering.

APPENDIX I

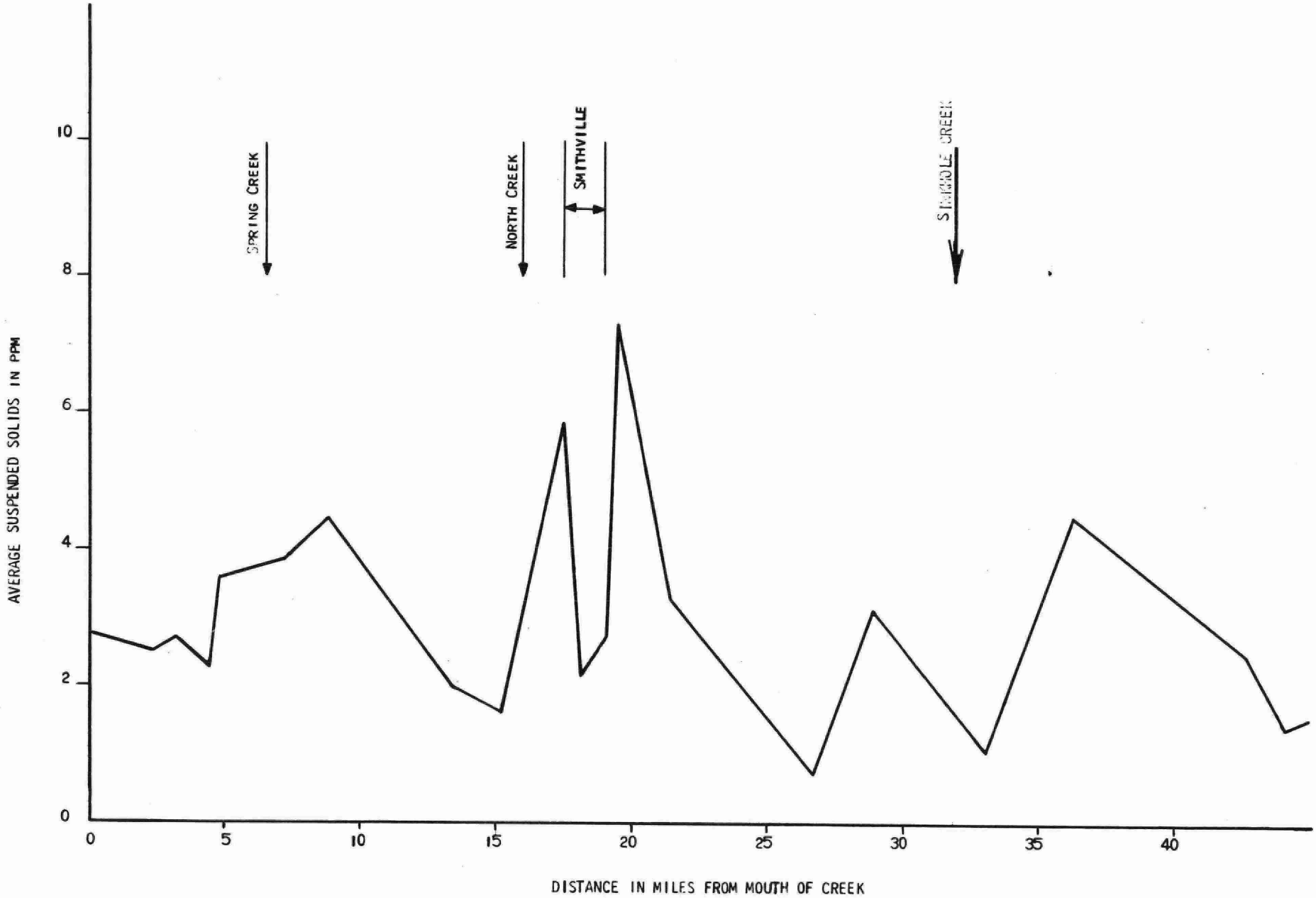
GRAPH - 1

B.O.D. vs DISTANCE

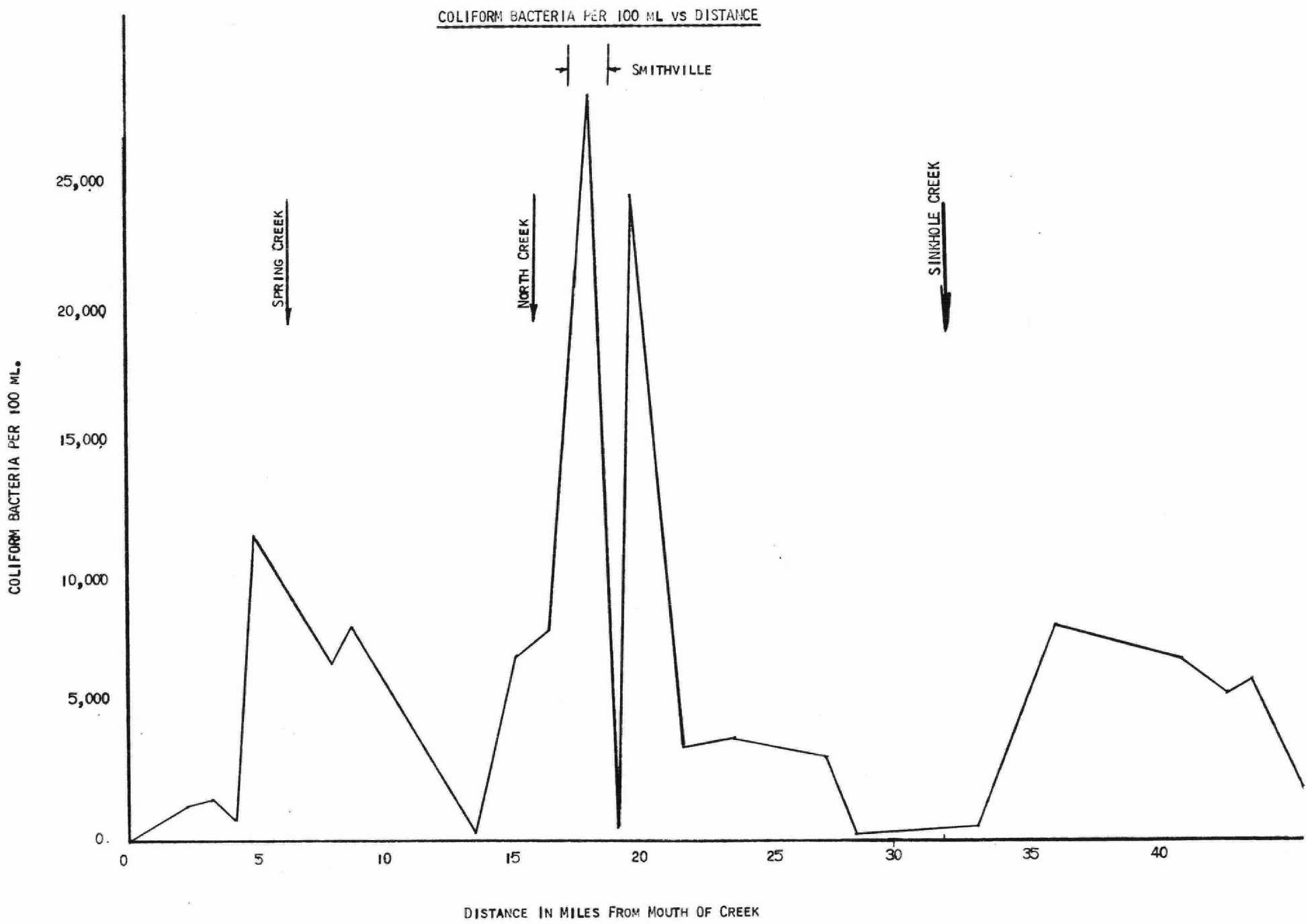


GRAPH - 2

SUSPENDED SOLIDS vs DISTANCE

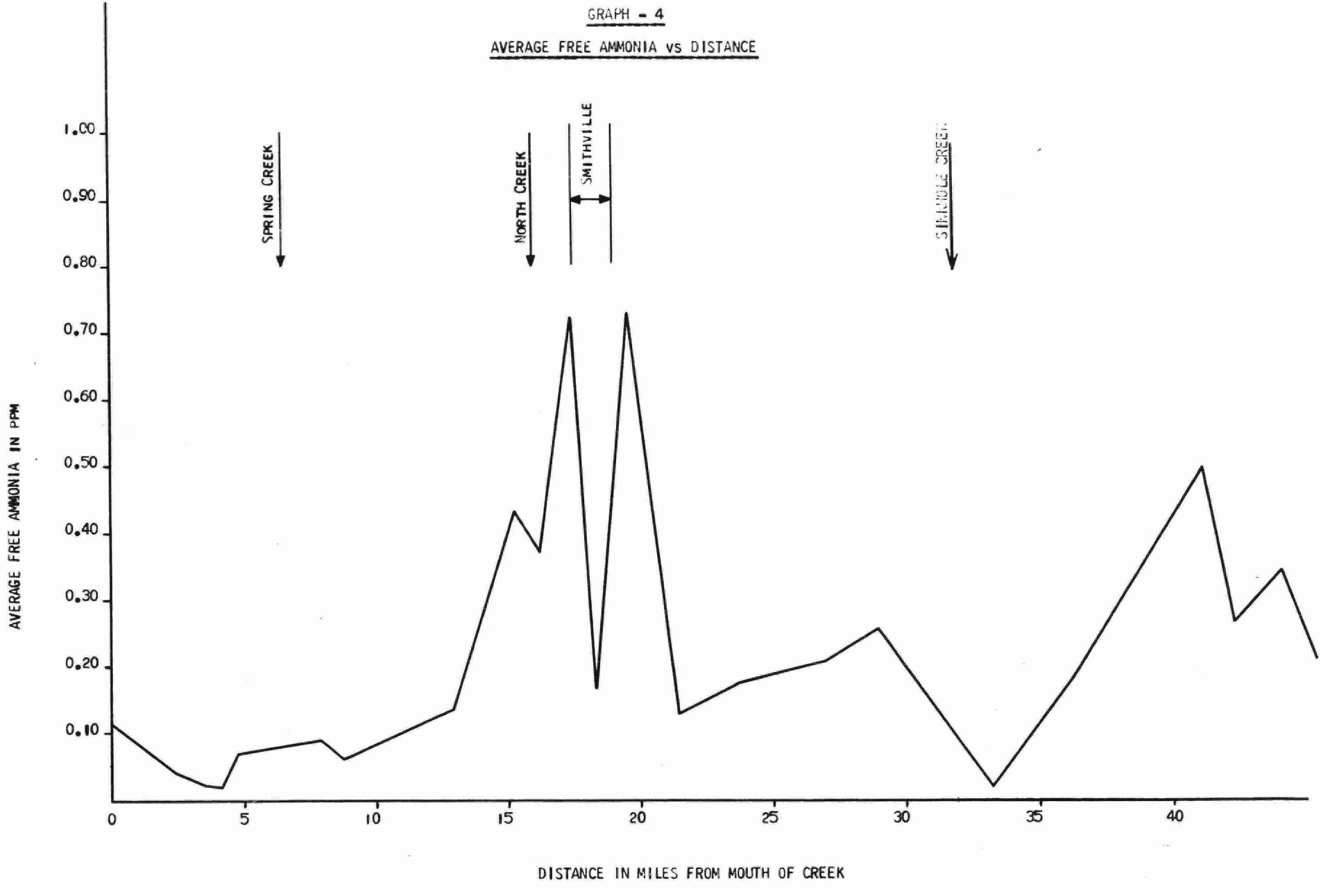


GRAPH 3


COLIFORM BACTERIA PER 100 ML VS DISTANCE
SMITHVILLE
SPRING CREEK
NORTH CREEK
SINKHOLE CREEK
COLIFORM BACTERIA PER 100 ML.
25,000
20,000
15,000
10,000
5,000
0.
0
5
10
15
20
25
30
35
40
DISTANCE IN MILES FROM MOUTH OF CREEK

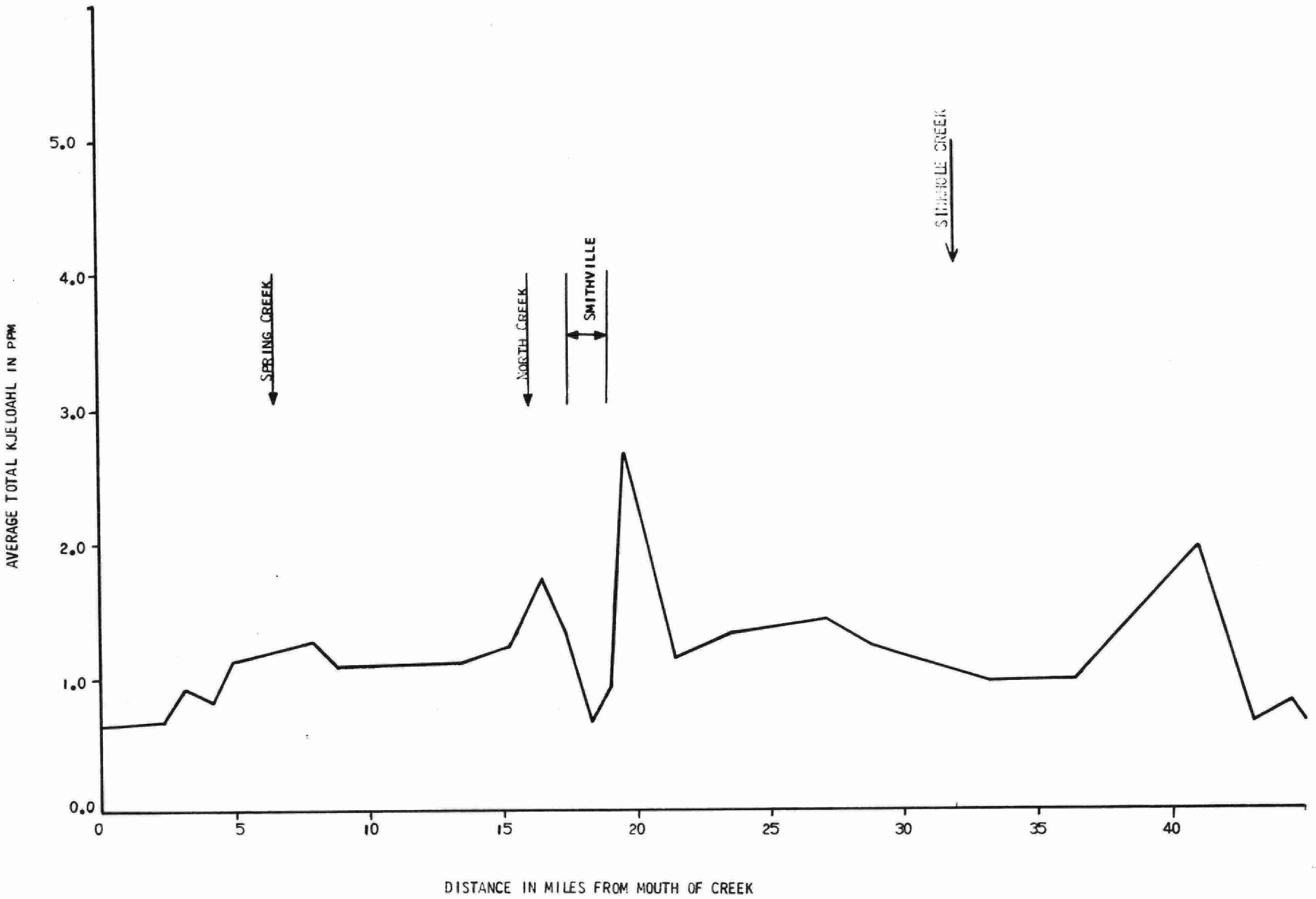
GRAPH - 4

AVERAGE FREE AMMONIA vs DISTANCE



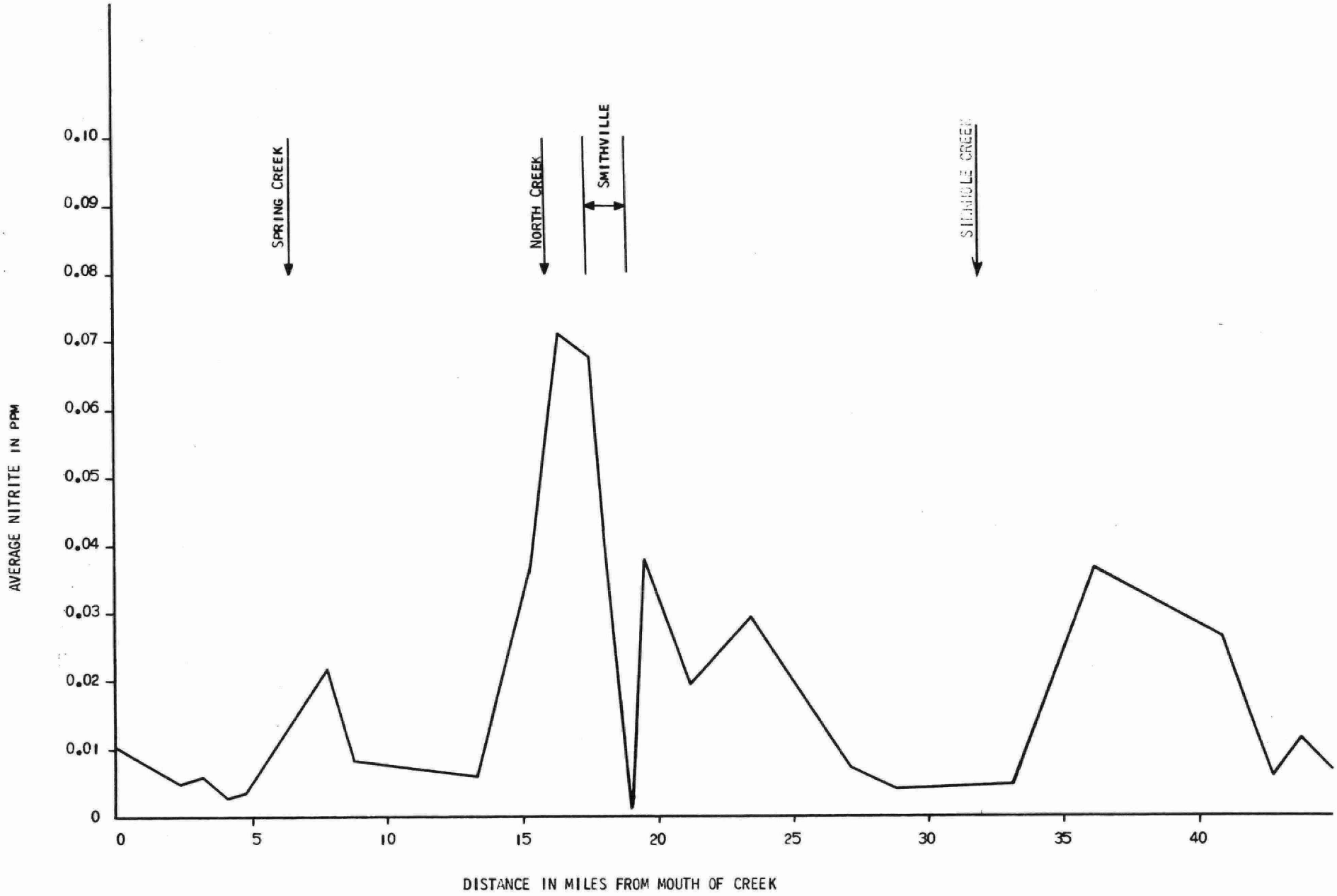
GRAPH - 5

AVERAGE TOTAL KJELDAHL vs DISTANCE



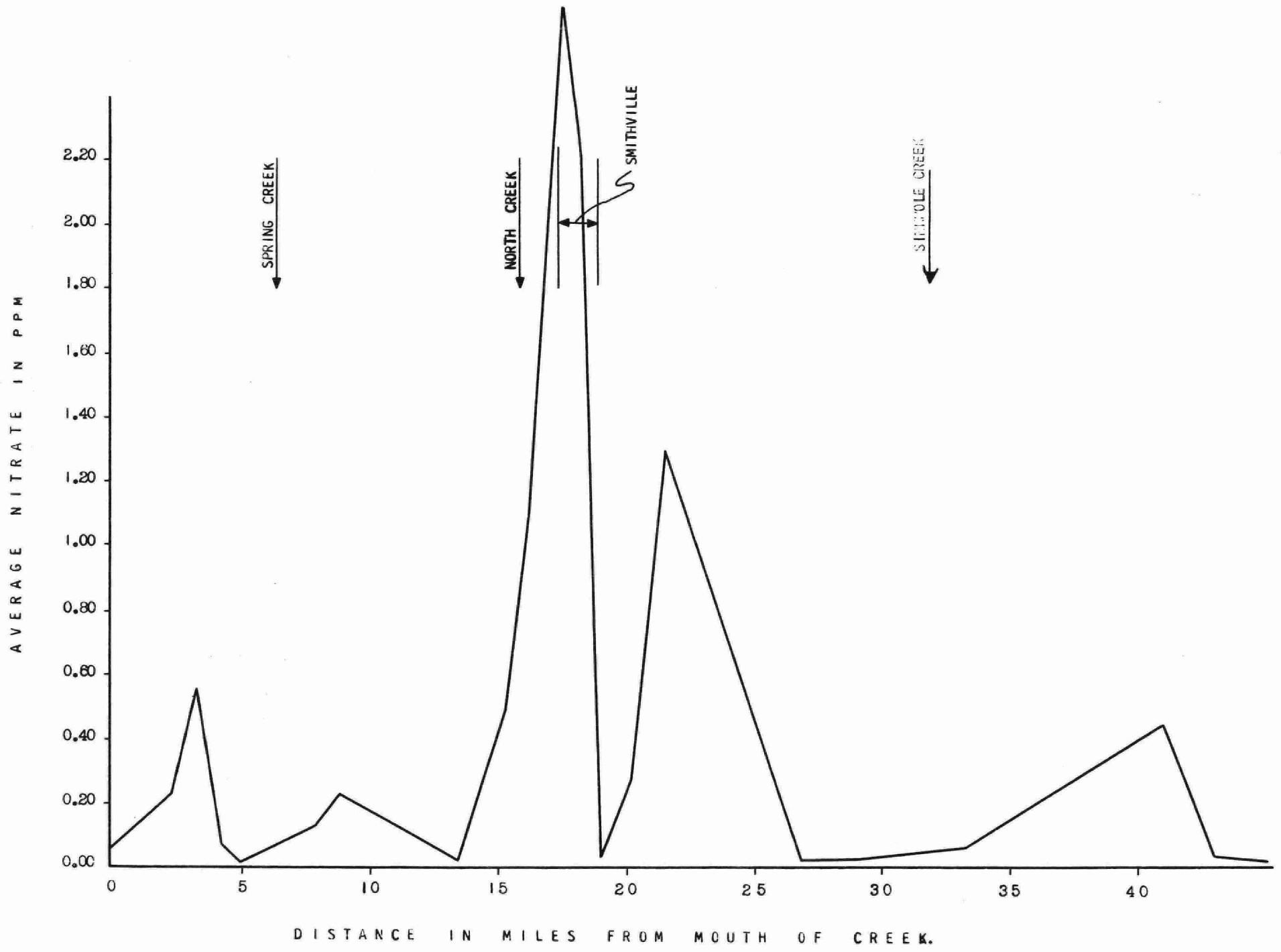
GRAPH - 6

AVERAGE NITRITE vs DISTANCE



GRAPH

AVERAGE NITRATE vs DISTANCE



GRAPH - 8

AVERAGE TOTAL PHOSPHOROUS AND AVERAGE SOLUBLE PHOSPHOROUS vs DISTANCE

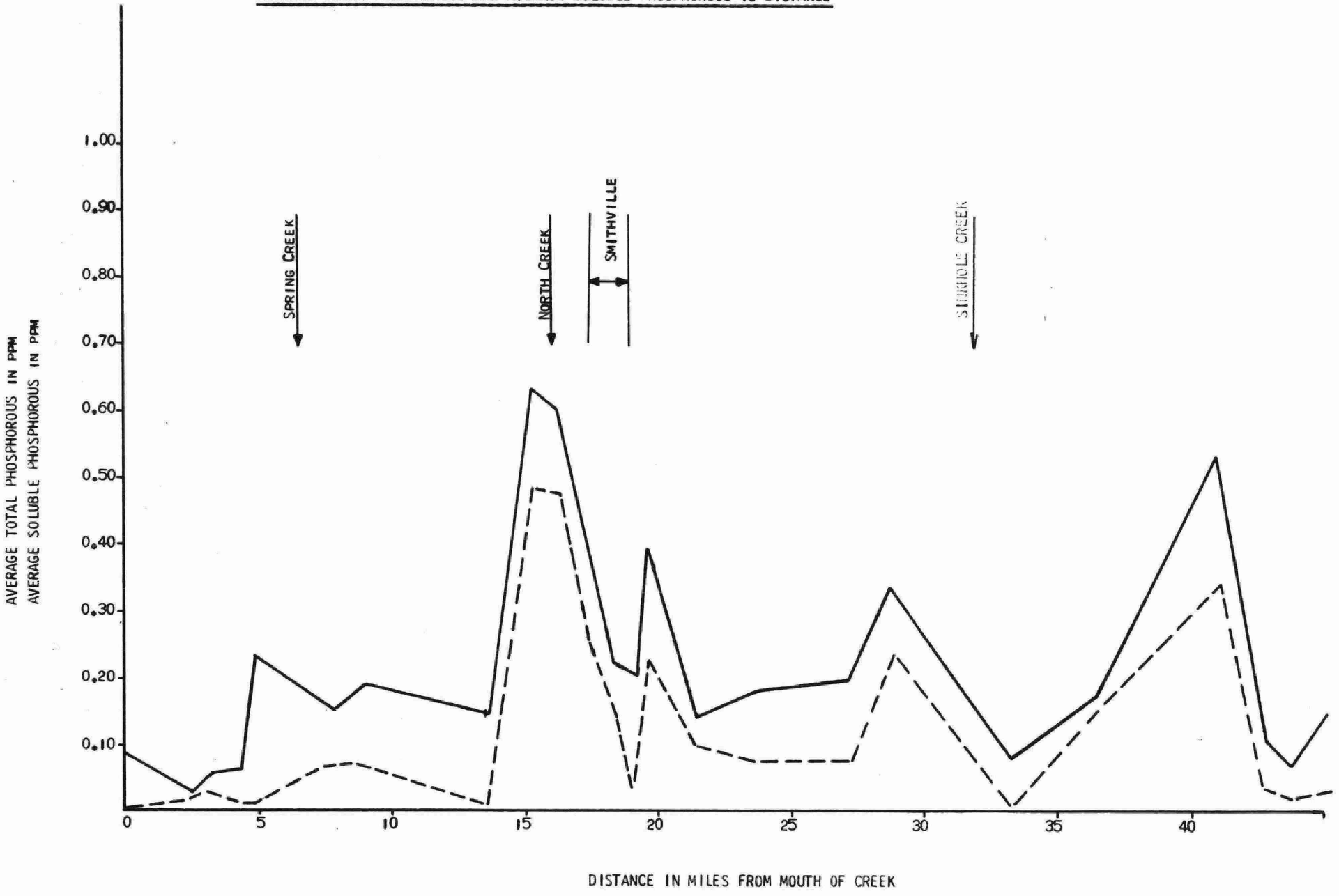


TABLE - 1

TWENTY-MILE CREEK POLLUTION SURVEY

1. SPRING SAMPLING RUN: APRIL 22, 23, 24, (WEATHER OVERCAST AND WET)
2. SUMMER SAMPLING RUN: JULY 23, 24, 25, (WEATHER SUNNY AND DRY)
3. FALL SAMPLING RUN: NOV. 19, 20 (WEATHER OVERCAST AND WET)

SAMPLING POINT	DISTANCE FROM MOUTH OF CREEK AT L. ONT. IN MILES	B.O.D. (PPM)		S.S. (PPM)			COLIFORM BACTERIA/100 ML			FAECAL COLIFORM/100 ML		
		2	3	1	2	3	1	2	3	1	2	3
NEBO ROAD	45.6	1.8	6.3	10	25	15	5,600	15	30	448	0	72
TRINITY CHURCH ROAD	43.8	1.9	-	20	10	-	7,300	100	-	70	30	-
FLETCHER'S ROAD	42.9	1.4	-	30	20	-	5,800	250	-	1,100	50	-
HIGHWAY #56	41.9	4.5	3.3	30	45	15	20,000	220	1,040	330	220	1,200
WOODBURN	36.3	1.0	1.8	70	10	45	1,300	50	24,000	170	10	3,200
TOWN LINE ROAD	33.2	1.0	3.7	20	10	5	430	1,200	270	-	10	16
SOUTH GRIMSBY ROAD #18	28.8	22.0*	3.4	10	80	5	300	0	140	4	0	12
SOUTH GRIMSBY ROAD #15	27.1	1.0	5.9	-	10	5	-	15	6,600	-	15	1,000
KIMBO	23.6	3.0	2.9	-	-	100	-	1,700	6,200	-	25	800
3RD ROAD ABOVE SMITHVILLE	21.5	1.0	2.5	-	25	40	-	20	7,300	-	20	390
1ST ROAD ABOVE SMITHVILLE	19.7	1.0	9.1	-	45	100	-	15	50,000	-	0	22,000
OLD WOODEN SUSPENSION BRIDGE	19.0	1.0	4.7	20	30	30	350	800	320	20	-	70
(CONCRETE OUTFALL) W-1	18.2	0.4	8.5	-	5	180	-	15,000	33,000	-	205	2,000
" " W-2	18.2	1.0	4.7	-	20	150	-	50,000	36,000	-	2,800	8,000
" " W-3	18.2	-	0.1	-	-	400	-	-	21,000	-	-	600
SMITHVILLE AT CANBOROUGH STREET	18.2											
SMITHVILLE AT MILL		0.6	5.7	30	10	20	300	17,000	37,000	40	200	400
1ST ROAD DOWNSTREAM FROM SMITHVILLE	17.5	1.4	2.0	20	60	100	110	18,000	60,000	20	430	580
2ND ROAD DOWNSTREAM FROM SMITHVILLE	16.4	1.8	4.5	30	40	30	260	7,000	17,000	10	1,300	4,000
BRIDGE IN ST. ANNS	15.1	1.0	3.3	30	10	5	180	50	7,000	70	15	310
SNYDER ROAD	13.4	1.0	2.0	20	25	15	230	-	350	80	-	220
ABOVE TINTERN	8.7	2.0	2.9	60	40	35	9,000	15	1,200	370	0	100
BELOW TINTERN	7.9	1.2	2.0	50	45	20	11,000	35	10,000	850	15	520
COUNTY LINE ROAD	4.9	0.8	6.1	60	5	45	4,000	300	31,000	200	95	40
AT BALLS FALLS	4.1	0.8	1.8	-	10	35	-	30	1,600	-	15	300
BRIDGE ABOVE JORDAN	3.2	-	2.2	50	-	5	4,000	170	460	560	135	190
BRIDGE BELOW JORDAN	2.4	0.6	1.2	30	10	5	4,000	150	180	332	15	110
CREEK AT L. ONT.	0.0	1.8	2.7	-	25	30	-	45	120	-	0	0

* NOT INCLUDED ON GRAPH

TABLE - II

TWENTY-MILE CREEK POLLUTION SURVEY

SAMPLING POINT	DISTANCE FROM MOUTH OF CREEK AT L. ONT. IN MILES	NITROGEN AS N (PPM) FREE AMMONIA 2	FREE AMMONIA 3	TOTAL KJELDAHL 2	TOTAL KJELDAHL 3	NITRITE 2	NITRITE 3	NITRATE 2	NITRATE 3	PHOSPHOROUS AS P(PPM) TOTAL 2	TOTAL 3	SOLUBLE 2	SOLUBLE 3	ANIONIC DETERGENTS AS LAS (PPM)3
NEBO ROAD	45.6	0.34	0.08	1.2	2.6	0.01	0.004	<0.01	0.02	0.14	0.16	0.05	0.02	<0.1
TRINITY CHURCH ROAD	43.8	0.35	-	0.79	-	0.011	-	0.01	-	0.07	-	0.05	-	-
FLETCHER'S ROAD	42.9	0.20	-	0.69	-	0.006	-	<0.01	-	0.11	-	0.05	-	-
HIGHWAY #56	41.0	0.06	0.97	1.5	2.4	0.004	0.050	<0.01	0.88	0.22	0.38	0.04	0.65	0.1
WOODBURN	36.3	-	0.19	0.51	1.4	-	0.037	-	2.40	0.13	0.22	-	0.18	0.2
TOWN LINE ROAD	33.2	-	0.02	-	0.92	-	0.005	-	0.06	-	0.08	-	0.01	-
SOUTH GRIMSBY ROAD #18	28.8	0.39	0.33	1.6	0.81	0.005	0.002	<0.01	0.02	0.66	0.03	0.44	0.01	-
SOUTH GRIMSBY ROAD #15	27.1	-	0.21	-	1.4	-	0.007	-	0.01	-	0.20	-	0.08	-
KIMBO	23.6	-	0.18	-	1.3	0.006	0.052	<0.01	9.10	0.23	0.14	0.11	0.06	-
3RD ROAD ABOVE SMITHVILLE	21.5	0.11	0.16	1.1	1.2	0.008	0.032	0.01	2.60	0.15	0.16	0.13	0.09	-
1ST ROAD ABOVE SMITHVILLE	19.7	-	0.73	1.6	3.7	-	0.037	-	0.20	0.16	0.65	-	0.23	0.1
OLD WOOLET SUSPENSION BRIDGE	19.0	-	0.02	1.0	0.82	-	.003	-	0.01	0.28	0.14	-	0.03	0.1
(CONCRETE OUTFALL) M-1	18.2													
" " M-2	18.2	-	1.0	-	1.80	-	0.046	-	2.40	-	0.85	-	0.24	0.1
" " M-3	18.2	-	0.78	-	1.00	-	0.100	-	0.30	-	0.70	-	0.13	0.2
SMITHVILLE AT CANBOROUGH STREET	18.2	-	0.29	0.80	1.80	-	0.046	-	2.40	0.12	0.85	-	0.24	0.2
SMITHVILLE AT MILL		-	0.17	0.82	0.44	-	0.042	-	2.30	0.12	0.34	0.08	0.24	<0.1
1ST ROAD DOWNSTREAM FROM SMITHVILLE	17.5	-	0.73	-	1.30	-	0.068	-	2.80	-	0.40	-	0.20	0.1
2ND ROAD DOWNSTREAM FROM SMITHVILLE	16.4	0.04	0.70	1.8	1.70	0.012	0.130	0.01	2.10	0.22	1.0	0.12	0.03	-
BRIDGE IN ST. ANNS	15.1	-	0.44	-	1.20	-	0.036	-	0.49	-	0.64	-	0.48	-
SNYDER ROAD	13.4	0.11	0.18	1.1	1.10	0.008	0.004	0.01	0.02	0.15	0.15	0.13	0.07	-
ABOVE TINTERN	8.7	0.05	0.07	1.2	0.94	0.010	0.008	0.01	0.45	0.29	0.10	0.15	0.02	-
BELOW TINTERN	7.9	0.07	0.11	1.5	1.00	0.014	0.008	0.02	0.24	0.28	0.09	0.13	0.02	-
COUNTY LINE ROAD	4.9	-	0.07	-	1.10	-	0.004	-	0.01	-	0.24	-	0.01	-
AT DALLS FALLS	4.1	-	0.02	-	0.80	-	0.003	-	0.07	-	0.07	-	0.01	-
BRIDGE ABOVE JORDAN	3.2	-	0.03	-	0.91	-	0.006	-	0.55	-	0.07	-	0.03	0.1
BRIDGE BELOW JORDAN	2.4	-	0.04	-	0.65	-	0.005	-	0.24	-	0.04	-	0.02	<0.1
CREEK AT L. ONT.	0.0	0.23	0.01	0.78	0.50	0.017	.003	0.05	0.08	0.07	0.12	0.012	<0.01	<0.1

TABLE - III

TRIBUTARIES OF 20-MILE CREEK

SAMPLING POINT	DISTANCE FROM MOUTH OF CREEK AT L. ONT. IN MILES	B.O.D. (PPM)			S.S. (PPM)			COLIFORM BACTERIA/100 ML			FAECAL COLIFORM/100 ML		
		1	2	3	1	2	3	1	2	3	1	2	3
SPRING CREEK													
SPRING CREEK RD. (AT PIG FARM)	10.3	3.5	-	-	40	-	-	2,100 4,200	4,800 7,900	-	-	-	-
SPRING CREEK RD. (NEAR SEPTIC TANK EFFLUENT)	8.2	-	11	-	-	65	-	-	59,000	-	-	-	-
SPRING CRK. RD. AT TINTERN	10.3	-	-	3.9	-	-	5	-	58,000	560	-	-	420
NORTH CREEK													
EAST FORK AT SIXTEEN RD.	16.4	-	3.0	-	-	150	-	-	120,000	-	-	135	-
NORTH CREEK BRIDGE	16.5	-	1.6	4.1	-	40	15	-	27,000	16,000	-	120	3,000
SINKHOLE CREEK													
TAPLEYTOWN ROAD	35.4	-	-	1.8	-	-	45	-	-	22,000	-	-	440
THREE MILE CREEK													
ENGLISH CHURCH RD. E.	48.1	-	-	3.1	-	-	5	-	-	6,000	-	-	348
AT MT. HOPE	49.9	-	-	3.1	-	-	15	-	-	1,400	-	-	92
CREEK NORTH OF BINBROOK NEAR PUBLIC SCHOOL													
AT HWY. #56 (BELOW SEPTIC TANK EFFLUENT)	-	-	55	-	-	110	-	-	80,000	-	-	36,000	-
DITCH NORTH OF JORDAN	2.5	-	5.0	9.1	-	10	110	-	11,000	8,500	-	115	670

TABLE - IV

TRIBUTARIES OF 20-MILE CREEK

SAMPLING POINT	NITROGEN AS N (PPM)								PHOSPHOROUS AS P (PPM)				ANIONIC DETERGENTS AS ABS (PPM)3
	FREE AMMONIA		TOTAL KJELDAHL		NITRITE		NITRATE		TOTAL		SOLUBLE		
	2	3	2	3	2	3	2	3	2	3	2	3	
SPRING CREEK													
SPRING CREEK RD. (AT PIG FARM)	-	-	-	-	-	-	-	-	-	-	-	-	-
SPRING CREEK RD. (NEAR SEPTIC TANK EFFLUENT)	2.0	-	2.3	-	0.080	-	0.02	-	0.80	-	-	-	-
SPRING CREEK RD. AT TINTERN	-	0.11	-	1.4	-	0.009	-	0.31	-	0.14	-	0.02	-
NORTH CREEK													
EAST FORK AT SIXTEEN RD.	0.06	-	3.2	-	0.014	-	0.01	-	0.20	-	0.06	-	-
NORTH CREEK BRIDGE	0.32	0.22	1.7	1.6	0.034	0.052	0.05	2.40	0.20	0.24	0.10	0.01	-
SINKHOLE CREEK													
TAPLEYTOWN ROAD	-	0.19	-	1.4	-	0.037	-	2.40	-	0.22	-	0.18	0.2
THREE MILE CREEK													
ENGLISH CHURCH RD. E.	-	0.04	-	0.93	-	0.010	-	0.29	-	0.12	-	0.07	<0.1
AT MT. HOPE	-	0.09	-	0.84	-	0.006	-	0.11	-	0.07	-	0.01	<0.1
CREEK NORTH OF BINBROOK NEAR PUBLIC SCHOOL													
AT HWY. #56 (BELOW SEPTIC TANK EFFLUENT)	-	-	27	-	0.032	-	0.03	-	12	-	-	-	-
DITCH NORTH OF JORDAN	0.18	1.1	0.74	2.00	0.280	0.150	1.1	1.90	0.06	0.75	0.02	0.45	0.1

APPENDIX II

APPENDIX II

1. LOUIS' CURED MEATS: The present plant was constructed in 1969 after a fire destroyed the previous buildings. Wastes from this establishment are kept in holding tanks until they are hauled away by truck.

   There is a record of periodic discharge from this industry to Twenty Mile Creek.

2. DORR BROTHERS WHOLESALE BUTCHERS: This industry uses about 1,550 gallons of water per week for its processing. Blood is segregated and sold to Albion Feeders. Inedibles are picked up by Albion Feeders and trucked to Ontario Rendering. All liquid wastes and allied substances are discharged to a holding tank. Each day the tank is pumped out and the material spread on adjacent farmland.

3. HIGHLAND PACKERS: A septic tank and tile field receives all wash waters from this plant. Blood is removed from the premises by Flash Pumping Service and the offal is directed to a rendering firm.

4. JOHN BLACK AND SONS, BUTCHERS: This establishment uses 100 gallons of water a week for its processing. All blood is spread on manure which is subsequently sold. Inedibles are picked up by Ontario Rendering. All wash water is initially discharged to a septic tank. The septic tank wastes are periodically pumped out and spread over 12 acres of land.

5. CHAMPION MEATS SLAUGHTERHOUSE: This operation has been closed.

6. PACONI DEADSTOCK REMOVAL LIMITED: All liquid wastes flow to a total retention waste holding lagoon. Daily water consumption is approximately 400 gallons.

7. PARON CHEESE COMPANY LIMITED: This establishment uses approximately 2,000 gallons of water a day. Whey is land disposed during the summer. During the winter the whey is distributed to hog breeders when possible or directed to treatment facilities. These facilities which also receive wash water year round, consist of two small lagoons in series which discharge to a final 930,000 gallon total retention lagoon via a 1,000 foot ditch. Drainage channels have been constructed on either side of the waste ditch to prevent runoff from gaining access to the lagoon.

8. THE GOS AND GRIS CHEESE FACTORY: This company uses approximately 2,100 gallons of water per day. Wash waters flow to a total retention lagoon with no overflow. Wastes are spray irrigated during the summer months. There is no discharge to Sinkhole Creek and the waste treatment facilities are operated in a generally satisfactory manner.

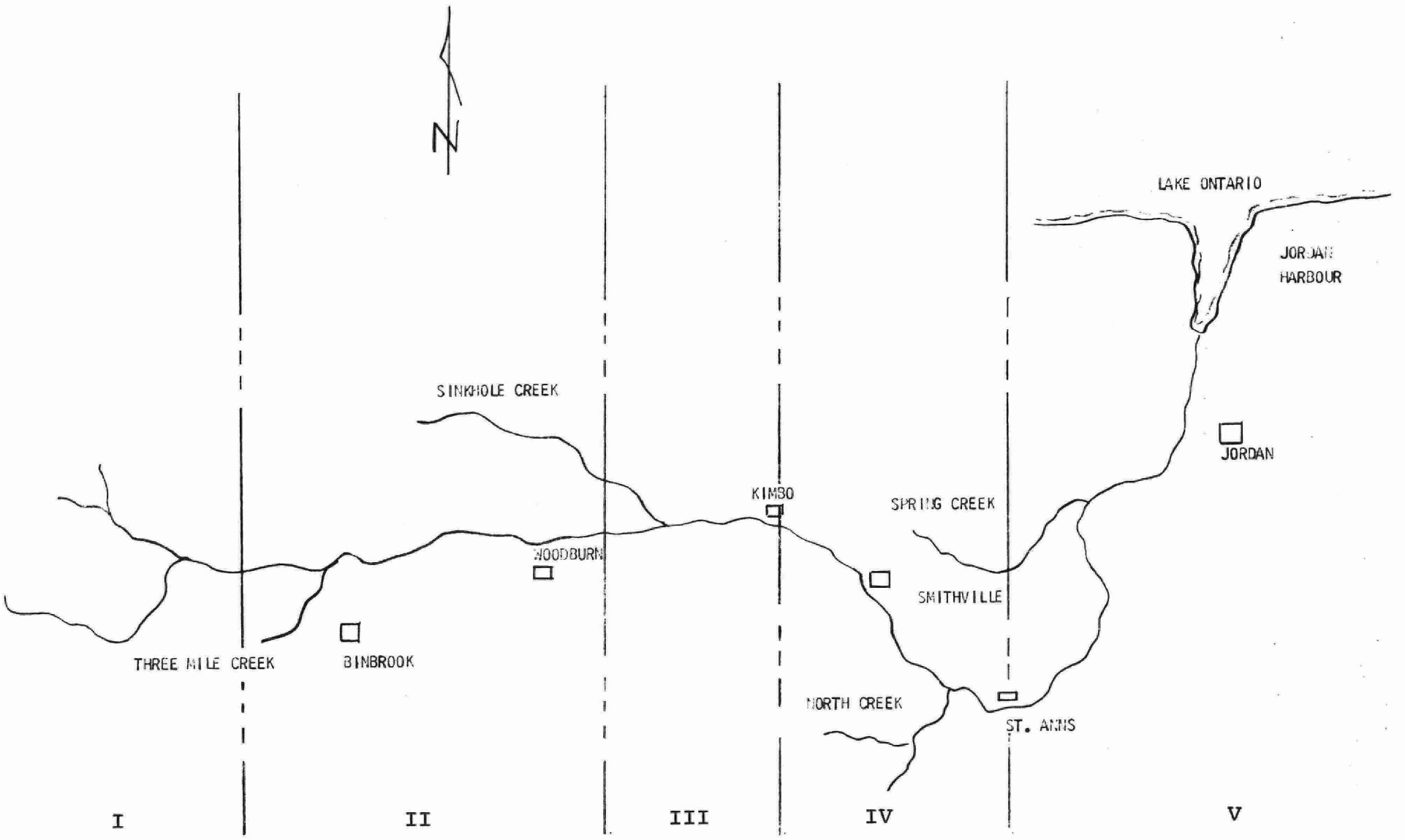
9. THE DELESSIO SLAUGHTER HOUSE: A new 470,000 gallon total retention lagoon has been completed and receives all wastes originating within the slaughter house except blood, inedibles and domestic wastes. These are satisfactorily removed for disposal. When the lagoon approaches capacity wastes are spray irrigated.

10. JULIUS PARKERS LIMITED: Offal and paunch manure are trucked away. Process water, as well as blood from the killing floor, is discharged to a two lagoon treatment system having a total capacity of 348,000 gallons.

11. TED'S MEAT MARKET: Liquid wastes flow to a 1,000 gallon septic tank which overflows into a 260,000 gallon total retention lagoon. The lagoon does not have an effluent structure and all waste is sprayed on surrounding flat land.

12. JORDAN WINES: Wastes from this industry are directed to two total retention lagoons. The 1.4 million gallon cell receives strong wastes such as grape skins, while the 4.5 million gallon cell receives weaker wastes such as wash water.

A P P E N D I X III



TWENTY MILE CREEK

SURVEY SECTIONS

(NOT TO SCALE)

APPENDIX IV

APPENDIX IV

1. Bacteriological Examination

The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. Ontario Water Resources Commission objectives for water used for body contact activities are that it should be free from pathogens including any bacteria, fungi or viruses that could produce enteric disorders or eye, ear, nose, throat and skin infections. Where ingestion is probable, recreational waters can be considered impaired when the coliform, faecal coliform, and/or enterococcus geometric mean density exceeds 1000, 100, and/or 20 per 100 ml. respectively, in a series of at least ten samples per month, including samples collected during weekend periods (see OWRC Guidelines and Criteria for Water Quality Management in Ontario, P. 24).

Until June 1970, the objectives for surface water quality in Ontario were a maximum of 2400 organisms per 100 millilitres.

2. Sanitary Chemical Analyses

a) Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (ppm) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The OWRC objective for surface water quality is an upper limit of four (4) ppm.

b) Solids

The value for solids, expressed in parts per million (ppm), is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids (s.s.) is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams and injury to the habitat of fish.

c) Nitrogen

(i) Ammonia Nitrogen or sometimes called free ammonia is the insoluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water. The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03 ppm; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

(ii) Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

(iii) Nitrite Nitrogen. Nitrite is usually an intermediate oxidation of ammonia. The significance of nitrites, therefore, varies with their amount, sources, and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrite present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousandths of a part per million is generally indicative of active biological processes in the water.

(iv) Nitrate Nitrogen. Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

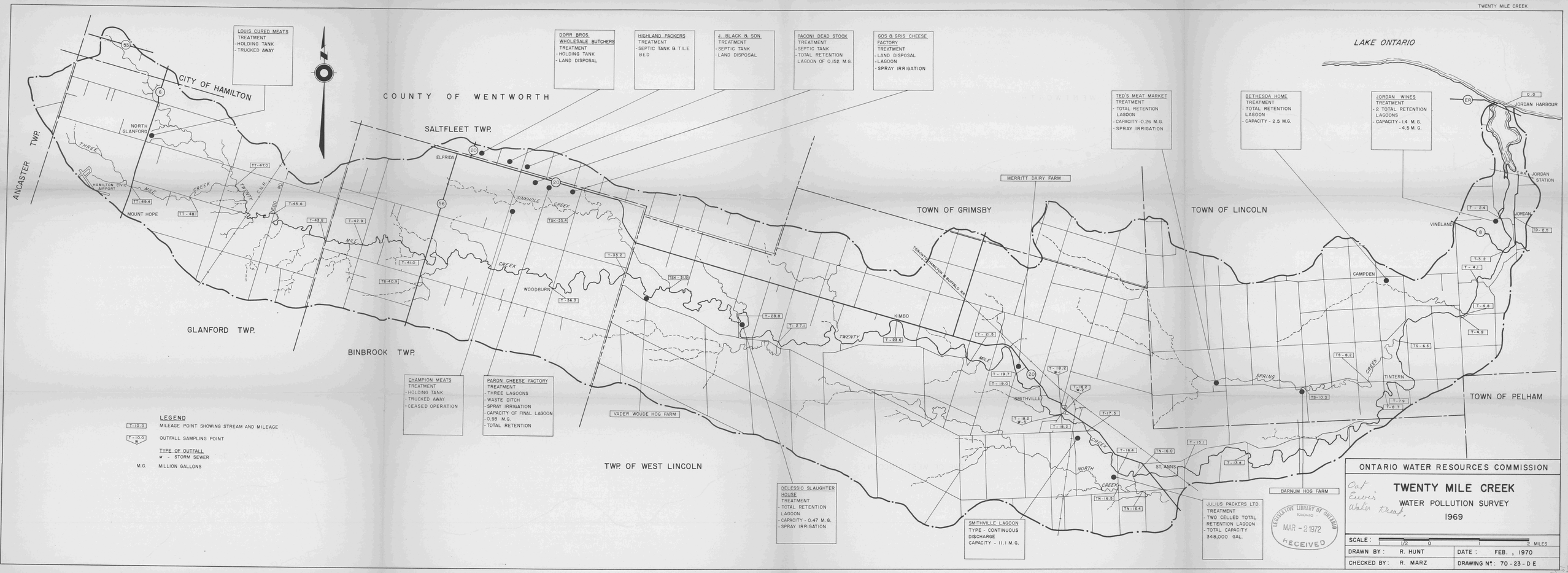
The following ranges in concentration may be used as a guide: low less than 0.1 ppm; moderate 0.1 to 1.0 ppm; high greater than 1.0 ppm.

d) Anionic Detergents as ABS

The presence of anionic detergents as ABS is an indication that domestic waste is present.

e) Phosphorus as P

The presence of Phopshorus is an indication of nutrient loading from either domestic or industrial wastes. The presence of inorganic Phosphorus in greater concentrations of 0.01 ppm does promote the growth of algae.



ONTARIO WATER RESOURCES COMMISSION

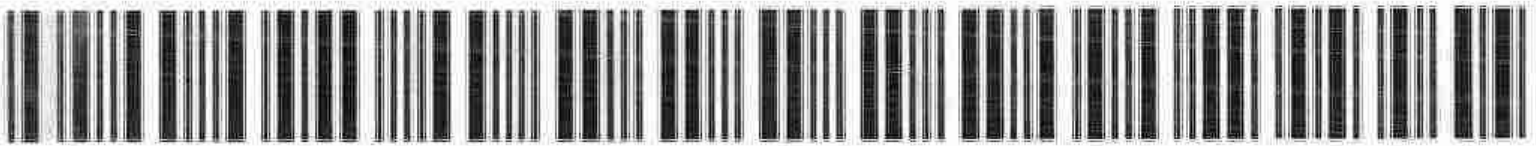
TWENTY MILE CREEK

WATER POLLUTION SURVEY

1969

Out Envir Water Treat

SCALE: 1/2 0 2 MILES	
DRAWN BY: R. HUNT	DATE: FEB. , 1970
CHECKED BY: R. MARZ	DRAWING Nº: 70-23-D E


9693600000 9288